

# **Cancer Incidence and Mortality in Massachusetts 1994-1998**



Massachusetts  
Department of  
Public Health

THE COMMONWEALTH OF MASSACHUSETTS  
EXECUTIVE OFFICE OF HEALTH AND HUMAN SERVICES  
DEPARTMENT OF PUBLIC HEALTH

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**CANCER INCIDENCE AND MORTALITY  
IN MASSACHUSETTS  
1994-1998:  
STATEWIDE REPORT**

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MAY 2001

## ACKNOWLEDGMENTS

This report was prepared by Susan T. Gershman, Director, Massachusetts Cancer Registry, and Massachusetts Cancer Registry staff and consultants. Special thanks to Laurie MacDougall for her diligent work in the preparation of this report. Thanks are given to Annie MacMillan, Mary Mroszczyk and Reggie Kenney for their editing and data processing efforts. Thanks are given to Dennis Sterzin of the Graphics staff for his cover design. The contributions of Mary McLaughlin and other staff in the Division of Data Processing, and the staff in approximately 83 reporting facilities are gratefully acknowledged.

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This report was supported by Cooperative Agreement Number U75/CCU110700-01-1 from the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention.

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# INTRODUCTION

## Content

This report:

- provides statewide information on cancer incidence in Massachusetts for twenty-three types of cancer and for all cancer sites combined for 1994 through 1998;
- provides detailed information about the four most commonly occurring types of cancer in males and females for 1994 through 1998;
- compares Massachusetts average cancer incidence for 1994-1998 with 1994-1998 data from the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program, which collects cancer incidence data from fourteen geographic areas in the United States;
- compares Massachusetts cancer mortality for 1994-1998 with 1994-1998 U.S. mortality<sup>1</sup>; and
- reviews Massachusetts cancer incidence trends for 1994 through 1998.

The report is organized into the following four sections:

**METHODS** provides a detailed explanation of the data collection, data processing and statistical techniques employed in this report.

**CANCER INCIDENCE AND MORTALITY IN MASSACHUSETTS** provides an overview of cancer incidence and cancer mortality in Massachusetts from 1994 through 1998. For selected cancer sites, and for all cancer sites combined, comparisons are made with data from the SEER program.

**TABLES 1 - 3** present data for twenty-three types of cancer, by sex, for 1994-1998.

**Table 1** provides the number of cases and the proportion of all cases represented by each cancer type;

**Table 2** presents and compares age-adjusted cancer incidence rates for Massachusetts, 1994-1998, and the SEER areas, 1994-1998;

**Table 3** presents and compares age-adjusted cancer mortality rates for Massachusetts, 1994-1998 and the U.S., 1994-1998;

**APPENDICES I - IV** provide data supplemental to this report.

**Appendix I** provides a listing of ICD (International Classification of Diseases) codes used for the preparation of this report;

**Appendix II** provides age-adjusted incidence rates for selected cancer sites/types, by sex, for individual years from 1994 through 1998;

**Appendix III** provides age-adjusted mortality rates for selected cancer sites/types, by sex, for individual years from 1994 through 1998;

**Appendix IV** provides age-specific incidence rates for selected sites, by sex, for 1994-1998.

## **Comparison with Previous Reports**

This report updates previous annual reports published by the Massachusetts Cancer Registry (MCR), and also provides a basis for comparison of cancer information to be contained in future reports.

This *Statewide Report* provides cancer incidence and mortality information for 1994-1998. The most recent *City/Town Supplement*, which contains standardized incidence ratios for selected cancers for the 351 cities and towns in Massachusetts for the period 1993-1997, was released via the Internet in November, 2000, and may be found at [www.state.ma.us/dph/bhsre/MCR/97/INDEX.HTM](http://www.state.ma.us/dph/bhsre/MCR/97/INDEX.HTM).

## METHODS

### Data Collection

The MCR collects reports of all newly diagnosed cancer cases from all Massachusetts acute care hospitals and one health maintenance organization (83 reporting facilities in 1998). The MCR compiles summaries of cancer incidence, such as this report, and also produces special reports. These undertakings require data collection efforts that necessitate extensive interaction with hospital tumor registrars. Intensive data evaluation is also required to ensure data quality. The fundamental requirements of any central cancer registry include: (1) complete registration, (2) prevention of duplication, (3) collection of uniform data, i.e., standardization of items, definitions, rules, classification and nomenclature of primary site, histology, staging and procedures, (4) quality control and (5) efficient data processing.

The Massachusetts data summarized in this report are drawn from data entered on MCR computer files on or before November 1, 2000 and from death clearance activities completed in October, 2000 (see below). The numbers herein may change slightly in future reports, reflecting late reported cases or corrections based on subsequent details from the reporting facilities. Such changes might result in slight differences in numbers and rates in future reports of MCR data. This is the nature of population-based cancer registries, which receive case reports on an ongoing basis.

The MCR began conducting “death clearance” in 1999 in order to identify cases of cancer reported on death certificates which had not been reported to the MCR. In conducting death clearance, the MCR database for 1995-1998 was linked with that of the Massachusetts Department of Public Health’s Registry of Vital Records and Statistics (1997 and 1998 resident deaths only). This was done to identify death certificates with any mention of cancer that do not match previously reported cases. These records were then followed back to determine if the cases met MCR reporting requirements. If they should have been submitted by a reporting facility, information was obtained from that facility, and the case was added to the MCR database. Cases for which the death certificate provided the only information regarding a diagnosis of cancer were also added to the database for 1997 and 1998, and are referred to as “death certificate only” cases. This addition of cases results in changes in 1997 and 1998 rates, particularly for those cancers with poor survival rates, such as liver cancer and pancreatic cancer (see p. 12).

MCR case ascertainment improved during the years covered by this report. For diagnosis year 1998, the MCR’s total case count was estimated by the North American Association of Central Cancer Registries to be complete.

Coding for primary sites in this report follows the International Classification of Diseases for Oncology (ICD-O, Second Edition) system. The list of reportable neoplasms is the same as that used for SEER program data with the exception of *in situ* neoplasms. SEER includes *in situ* bladder cases in its age-adjusted bladder cancer

incidence rates; however, the MCR does not. The MCR began collecting data on *in situ* neoplasms diagnosed as of January 1, 1992; however, *in situ* cases are not included in this report. Comparisons between SEER and MCR data are valid because the codes used for primary site selection are identical (Appendix I).

## **Data Presentation**

### ***Time Periods***

This publication focuses on cancer incidence and mortality in Massachusetts for the time period 1994-1998. Other cancer data presented herein may encompass different aggregate years because of availability at the time of publication. Incidence data in the SEER areas and U.S. mortality data as published by the National Cancer Institute are presented for the same time period (see Ries *et al.* in REFERENCES).

### ***Age-Adjusted Rates***

National (SEER) incidence rates, U.S. mortality rates and Massachusetts statewide incidence and mortality rates are sex-specific, age-adjusted rates per 100,000 population, and are calculated by the direct method using the 1970 U.S. Bureau of the Census population distribution as the standard.<sup>1</sup> Rates are age-adjusted using five-year age groups to correct for differences in the age distributions of different populations. Rates adjusted to the same standard can be compared. It is important to note that differences in methodologies used in calculating rates, such as number of age groups used, may cause slight variations in results.

For the computation of Massachusetts age-adjusted incidence and mortality rates in this report, the statewide population for individual years is based on population estimates released by the Massachusetts Institute for Social and Economic Research (MISER) in September, 2000. For reports prior to *Cancer Incidence in Massachusetts, 1982-1989*, the statewide population for individual years was derived from estimates based on 1980 U.S. Bureau of the Census counts and 1990 projections obtained from MISER. If rate comparisons are made to any of these prior reports, data may vary slightly due to these population adjustments.

National age-adjusted incidence rates in this report are obtained from the National Cancer Institute's SEER program data, representing the largest cancer incidence database in the U.S. These data serve as a stable reference point because the SEER areas include approximately 14% of the U.S. population. The SEER program incidence data included in this report are from population-based cancer registries in five states

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<sup>1</sup> It should be noted that the age-adjusted cancer mortality rates presented in this report cannot be compared to those appearing in the Massachusetts Department of Public Health's *Advance Data: Deaths* series because the latter rates are adjusted to the 1940 U.S. Standard Population. This report adjusts to the 1970 U.S. Standard Population for consistency with procedures used by the National Cancer Institute.

(Connecticut, Hawaii, Iowa, New Mexico and Utah) and six standard metropolitan statistical areas (Atlanta, Georgia; Detroit, Michigan; Los Angeles, California; San Francisco-Oakland, California; San Jose-Monterey, California and Seattle -Puget Sound, Washington), as well as three supplemental registries of special populations.

U.S. age-adjusted mortality rates in this report are obtained from the National Center for Health Statistics, as published by the National Cancer Institute's SEER program.

### ***Age-Specific Rates***

Massachusetts statewide age- and sex-specific rates per 100,000 residents are given for twenty-three selected types of cancer and all types of cancer combined in Appendix IV.

### **Data Limitations**

Three limitations must be considered when interpreting cancer incidence data in this report: under-reporting in areas close to neighboring states; under-reporting for cancers that may not be diagnosed in hospitals; and minor incidence changes resulting in misleadingly large percent differences for rare types of cancer.

### ***Border Areas and Neighboring States***

Some areas of Massachusetts appear to have low cancer incidence, but this may be due to loss of cases in Massachusetts residents who were diagnosed in neighboring states and not reported to the MCR. Presently the MCR has reciprocal reporting agreements with the following fifteen states: Alaska, Arkansas, Connecticut, Florida, Maine, Mississippi, New Hampshire, New York, North Carolina, Rhode Island, South Carolina, Texas, Vermont, Wisconsin and Wyoming.

### ***Cases Diagnosed in Non-Hospital Settings***

During the time period covered by this report (1994 through 1998), the MCR's information sources for nearly all newly diagnosed cases of cancer were hospitals. Some types of cancer in this report may be under-reported because they are diagnosed by private physicians, private laboratories, health maintenance organizations or radiotherapy centers that escape the case identification systems used by hospitals. Particular examples include melanoma of the skin, prostate cancer and certain hematologic malignancies such as leukemia and multiple myeloma. The extent of this under-reporting has not been determined exactly, but cases included in this report represent the great majority of cases statewide and provide an essential basis for observing statewide cancer incidence patterns.

### ***Percent Differences***

The interpretation of percent increases or decreases should be viewed with caution. Apparent increases or decreases in cancer incidence over time may reflect changes in diagnostic methods or case reporting rather than true changes in cancer occurrence. Also, a percent increase or decrease in cases for a cancer with a higher incidence rate has greater public health significance, since larger numbers of patients are affected. For a cancer with a base incidence rate of 100 cases per 100,000 residents, an increase of 25% adds 25 cases per 100,000; for a rarer cancer with a base rate of 8 cases per 100,000, the same increase (25%) adds 2 cases per 100,000.

## **CANCER INCIDENCE AND MORTALITY IN MASSACHUSETTS**

### **Cancer Incidence and Mortality (1994-1998)**

In Massachusetts from 1994 through 1998, there were 152,148<sup>2</sup> newly diagnosed cases of cancer – 75,973 in males and 76,157 in females (Table 1).

For all types of cancer combined for 1994-1998, the average annual age-adjusted incidence rate among males was 490.3 cases per 100,000 (Table 2). The most commonly diagnosed type of cancer in Massachusetts males for this time period was prostate cancer, followed by cancer of the bronchus and lung, colon/rectum and urinary bladder (Figure 1).

For all types of cancer combined for 1994-1998, the average annual age-adjusted incidence rate among females was 367.6 cases per 100,000 (Table 2). Among Massachusetts females, the most commonly diagnosed cancer types were cancers of the breast, bronchus and lung, colon/rectum, and corpus uteri (uterus) (Figure 1).

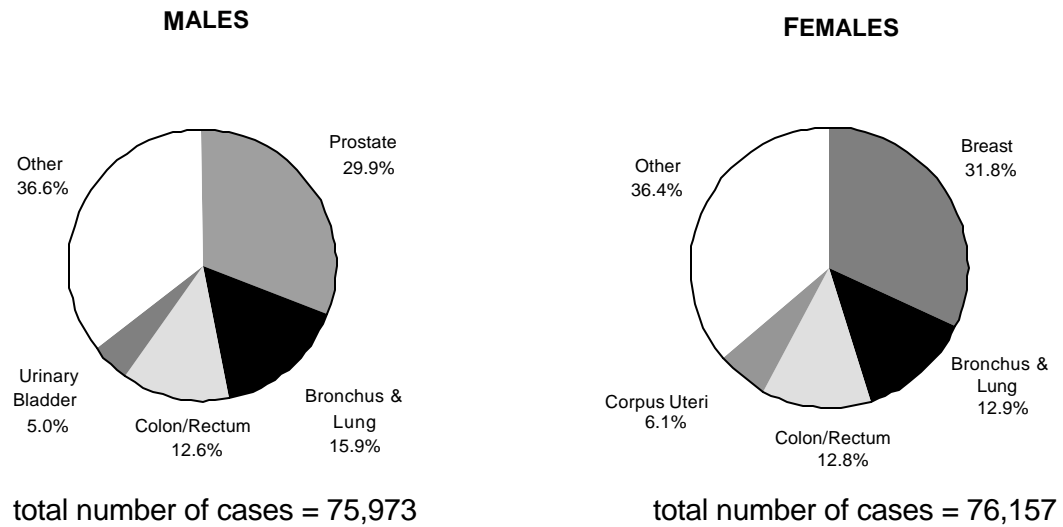
In both sexes, the four leading types of cancer comprised approximately 63% of all new cancer cases for this time period (Figure 1). No other type of cancer constituted more than 5% of new cases in either sex.

In both sexes, the four leading types of cancer comprised approximately 57% to 58% of all cancer deaths for this time period (Figure 2). Lung cancer was the leading cause of cancer deaths in both males and females (Table 3). No other type of cancer constituted more than 5% of cancer deaths in either sex.

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<sup>2</sup> The male and female case counts will not add up to the total case count because the MCR added two additional gender classifications (transsexuals and persons with sex chromosome abnormalities/hermaphrodites) for cases diagnosed as of January 1, 1995. Cases diagnosed before this date were limited to male or female only.

**Figure 1**  
**DISTRIBUTION OF CANCER INCIDENCE IN MASSACHUSETTS, 1994-1998**  
**by Cancer Type and Sex**



Data for the four leading types of newly diagnosed cancers among males and females for 1994-1998 are summarized below.

**Massachusetts Incidence, 1994-1998**

**M A L E S**

Cancer Site	% of all Cases	Age-adjusted incidence rate (per 100,000)
Prostate	29.9%	151.0
Bronchus & Lung	15.9%	78.8
Colon / Rectum	12.6%	61.0
Urinary Bladder	5.0%	24.2

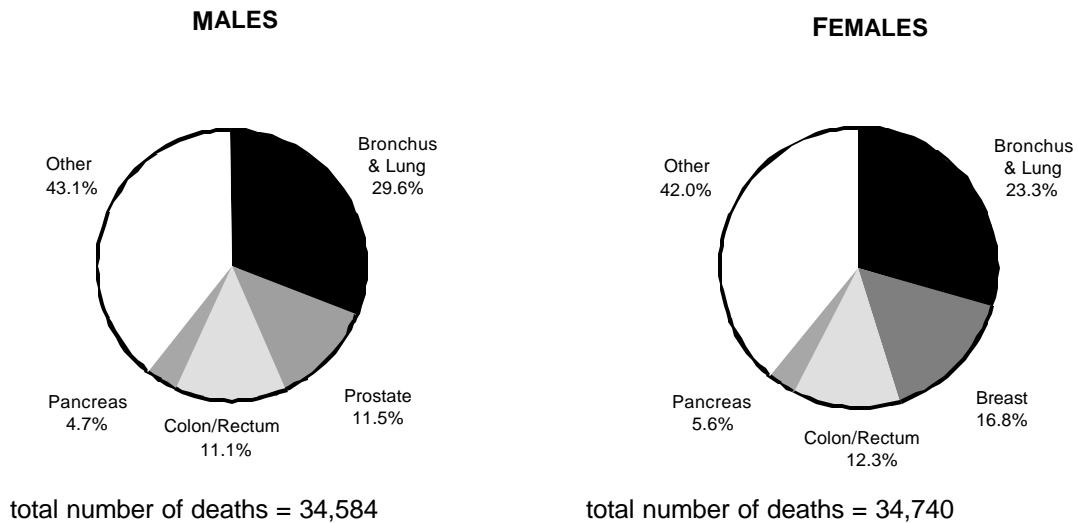
**total: 63.4%**

**F E M A L E S**

Cancer Site	% of all Cases	Age-adjusted incidence rate (per 100,000)
Breast	31.8%	122.5
Bronchus & Lung	12.9%	49.2
Colon / Rectum	12.8%	41.3
Corpus Uteri	6.1%	24.3

**total: 63.6%**

**Figure 2**  
**DISTRIBUTION OF CANCER MORTALITY IN MASSACHUSETTS, 1994-1998**  
**by Cancer Type and Sex**



Data for the four leading types of cancer deaths among males and females for 1994-1998 are summarized below.

**Massachusetts Mortality, 1994-1998**

**M A L E S**

Cancer Site	% of all Cancer Deaths	Age-adjusted mortality rate (per 100,000)
Bronchus & Lung	29.6%	65.3
Prostate	11.5%	23.3
Colon / Rectum	11.1%	23.7
Pancreas	4.7%	10.3

**total: 56.9%**

**F E M A L E S**

Cancer Site	% of all Cancer Deaths	Age-adjusted mortality rate (per 100,000)
Bronchus & Lung	23.3%	37.5
Breast	16.8%	26.1
Colon / Rectum	12.3%	15.9
Pancreas	5.6%	7.8

**total: 58.0%**

## Massachusetts Incidence Compared with the U.S.

The overall pattern of cancer incidence in Massachusetts is similar to the national pattern (as measured in the SEER areas). Average annual age-adjusted incidence rates for all sites combined in Massachusetts and the SEER areas are presented below. (See Table 2 for comparable rates by cancer site/type.)

### TOTAL NUMBER OF CASES PER 100,000:

	MA, 1994-1998	SEER areas, 1994-1998
<b>MALES</b>	<b>490.3</b>	<b>468.5</b>
<b>FEMALES</b>	<b>367.6</b>	<b>352.8</b>
<b>TOTAL</b>	<b>416.4</b>	<b>400.5</b>

In the following summary, two simultaneous criteria have been employed to determine whether relative excesses or deficits existed for individual types of cancer in Massachusetts for 1994-1998 compared to the SEER areas in 1994-1998: first, the average annual age-adjusted incidence rate in Massachusetts for 1994-1998 is at least 20% higher or lower than the SEER areas' rate for 1994-1998; and second, the average annual age-adjusted incidence rate in Massachusetts is at least five cases per 100,000 residents for 1994-1998.

### MALES

A relative excess existed for:

- esophagus  
1994-1998 MA rate: 9.1/100,000      1994-1998 SEER rate: 6.5/100,000      (MA 39.5% above SEER)
- larynx  
1994-1998 MA rate: 8.4/100,000      1994-1998 SEER rate: 6.5/100,000      (MA 28.8% above SEER)

### FEMALES

A relative deficit existed for:

- pancreas  
1994-1998 MA rate: 6.0/100,000      1994-1998 SEER rate: 7.8/100,000      (MA 23.6% below SEER)

## Cancer Incidence and Mortality Trends

### Incidence

When incidence rates are compared for the two endpoints of this report (1994 and 1998), overall cancer incidence increased 5.1% (2.9% in males, and 7.0% in females). It is important to note, however, that rates for 1997 and 1998 also include cases identified only on death certificates, which had not been done in previous years. This addition of cases elevated incidence rates by 10% or more for certain cancers, such as pancreatic cancer and liver cancer, which have shorter survival times and may not be diagnosed prior to death. Rates for 1997 and 1998 may not be directly comparable to those for previous years because of this inclusion of “death certificate only” cases. Incidence patterns may appear different than expected, with some cancers exhibiting no change in – or even overall increases in – incidence rates despite prior trends downward. However, increases and decreases can be seen to occur through time in the leading cancers affecting Massachusetts men and women. (See Appendix II for the age-adjusted incidence rates presented here, and Figures 3A, 3B, 4A, 4B, and 5-7 for a more detailed summary of incidence and mortality trends for the leading cancers and others discussed here.)

### Males

Among Massachusetts males, prostate cancer increased 7.7% between 1994 and 1998 (see Figures 3A and 7). The 1994 incidence rate was 141.4 cases per 100,000 males, and the 1998 rate increased to 152.4 cases per 100,000 males. Devesa *et al.* (see REFERENCES) attribute national increases in prostate cancer incidence over the past decade to changes in diagnostic methodology. Transurethral resections were performed more frequently in the 1980s than in the preceding decade, resulting in increased detection of cases which would have been undetectable by clinical means. Other diagnostic procedures (such as serum testing for prostate-specific antigen (PSA), ultrasound-guided needle biopsy, computed axial tomography (CAT scanning) and bone scanning) have also increased the number of prostate cancer diagnoses in recent years. Wingo *et al.* (1998; see REFERENCES) attribute the more recent downtrends in prostate cancer (since 1992) to the identification of prevalent cases through screening, and then the subsequent falling toward an equilibrium, reflecting only incident cases in the population. Also, there may have been decreased utilization of PSA screening tests in recent years, which might have been precipitated by recommendations by some organizations against their widespread use during the early 1990s. Although the Massachusetts rate has increased between 1994 and 1998, there still has been an overall decrease from its peak incidence of 177.7 per 100,000 in 1992. While there have been fluctuations, the prostate cancer rate seems to be stabilizing.

Age-adjusted incidence rates declined for the second and third most commonly diagnosed cancers in males. The incidence rate for cancer of the bronchus and lung fell from 81.1 cases per 100,000 males in 1994 to 78.8 cases per 100,000 in 1998, a decrease of 2.8% (see Figures 3A and 5). Wingo *et al.* (1999; see REFERENCES)

attribute the national decline in lung cancer incidence to cancer control and research programs. The incidence rate of colo-rectal cancer fell from 62.8 cases per 100,000 males in 1994 to 60.9 cases per 100,000 in 1998, a decrease of 3.0% (see Figures 3A and 6). Troisi *et al.* (see REFERENCES) used SEER data to show overall decreases in the incidence rates of colo-rectal cancer. They noted stage-specific shifts which they attributed to earlier detection, most likely due to screening.

The incidence of non-Hodgkin's lymphoma among Massachusetts males has been fairly stable between 1994 and 1998 (see Figure 3A). Devesa *et al.* attribute the rise in national incidence rates during the early 1990s to changes in case classification, greater exposure to potential causative agents, and the increasing incidence of AIDS-related lymphomas. The rate of increase in non-Hodgkin's lymphomas, however, has slowed in recent years. Wingo *et al.* (1998) attribute this to the beneficial effects of antiretroviral therapies on the rate of HIV progression.

Incidence of melanoma of the skin continued to increase among Massachusetts males. In 1994, 12.5 males per 100,000 were diagnosed with melanoma of the skin. By 1998, the incidence rate had risen to 16.1 per 100,000, an increase of 28.8% (see Figure 3A). Devesa *et al.* attribute this rise in incidence to increased exposure to solar radiation due to changing recreational and clothing habits.

### Females

Among Massachusetts females, breast cancer incidence increased between 1994 and 1998 (see Figures 3B and 7). The incidence rate increased from 118.1 cases per 100,000 females in 1994 to 128.3 cases per 100,000 in 1998, an increase of 8.7%. Devesa *et al.* attribute most of the increase in national breast cancer incidence to the earlier detection of tumors resulting from increasing use of mammography and other screening techniques. Other contributing factors may include changes in diet, alcohol consumption, the long-term use of hormone replacement therapy, and certain reproductive variables (such as later age at first childbirth). It seems that the increase in breast cancer incidence in Massachusetts is most likely attributable to increased screening and better casefinding. An analysis of breast cancer incidence by stage at diagnosis shows a 15% increase in both *in situ* and local stage-specific incidence rates, which points to the impact screening programs have made regarding early diagnosis. An analysis of breast cancer incidence by age shows the increased rates to be primarily in women aged 40 to 64, consistent with increased screening rates in these age groups.

The incidence of cancers of the bronchus and lung continues to increase among Massachusetts females, rising from 46.1 cases per 100,000 females in 1994 to 50.3 cases per 100,000 in 1998, an increase of 9.3% (see Figures 3B and 5). Wingo *et al.* (1999) noted that the prevalence of smoking in women has lagged behind that in men, reaching a peak of 55% in the cohort of women born between 1935 and 1944. Consequently, the incidence of lung cancer is still increasing in women, reflecting the historical pattern of cigarette smoking. The third most common cancer among

Massachusetts females, colo-rectal cancer, was stable at approximately 40 cases per 100,000 for both 1994 and 1998 (see Figures 3B and 6). Uterine cancer, the fourth most common cancer among Massachusetts females, increased slightly from 1994 to 1998 (see Figure 3B). The 1994 incidence rate of 23.3 cases per 100,000 females rose to 25.2 cases per 100,000 in 1998, an increase of 8.2%.

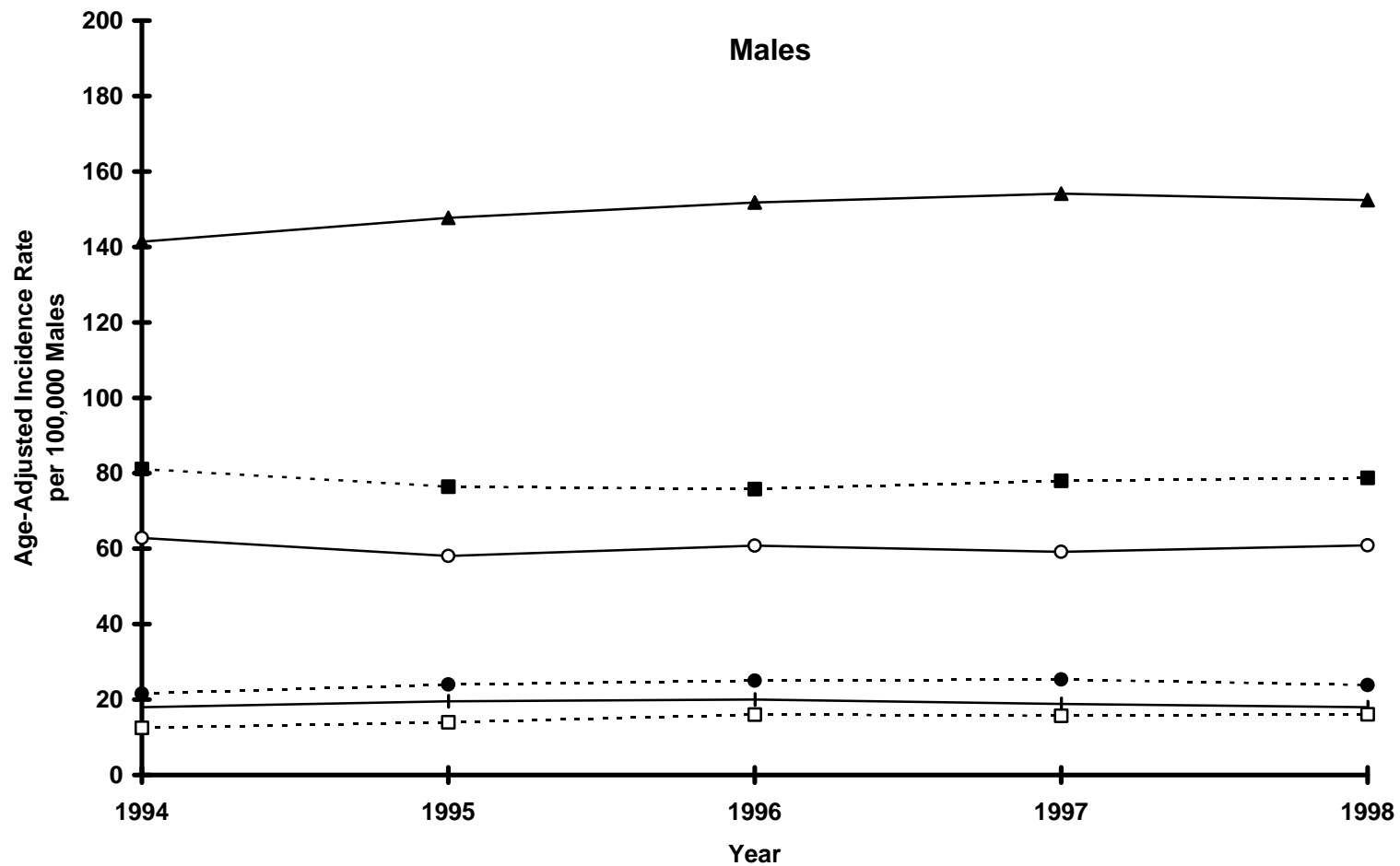
### **Mortality**

When cancer mortality rates are compared for the two endpoints of this report (1994 and 1998), certain changes are notable. For males, decreasing death rates have been observed nationally and in Massachusetts for lung and prostate cancers (see Figure 4A). Wingo *et al.* (1999) attribute decreasing national lung cancer mortality rates in men to decreased smoking rates over the past thirty years. The decrease in smoking among women, however, has lagged behind that of men, and lung cancer mortality, like incidence, continues to rise in women. For Massachusetts females, lung cancer replaced breast cancer as the leading cause of cancer deaths in 1989, and female lung cancer death rates have since continued to increase while breast cancer death rates have decreased (see Figure 4B). Wingo *et al.* (1998) attribute the downtrend in national breast cancer mortality to the incorporation of breast cancer screening into routine medical care. Advances in the treatment of breast cancer also contribute to the decline in breast cancer mortality.

For colo-rectal cancer, the decreases in mortality among males and females are not well understood (see Figures 4A and 4B). Wingo *et al.* (1998) suggest several possibilities, including increased polyp removal, advances in treatment protocols (e.g., new surgical techniques and adjuvant therapies), and other factors, such as changes in dietary patterns. The explanation for the decline in prostate cancer mortality is also uncertain (see Figure 4A).

Figure 3A

Massachusetts Cancer Incidence Trends  
for Selected Cancer Types, 1994-1998



—▲— Prostate    - - ■ - - Bronchus & Lung    —○— Colon / Rectum    - - ◆ - - Urinary Bladder    —+— Non-Hodgkin's Lymphoma    - - □ - - Melanoma of Skin

Figure 3B

Massachusetts Cancer Incidence Trends  
for Selected Cancer Types, 1994-1998

Females

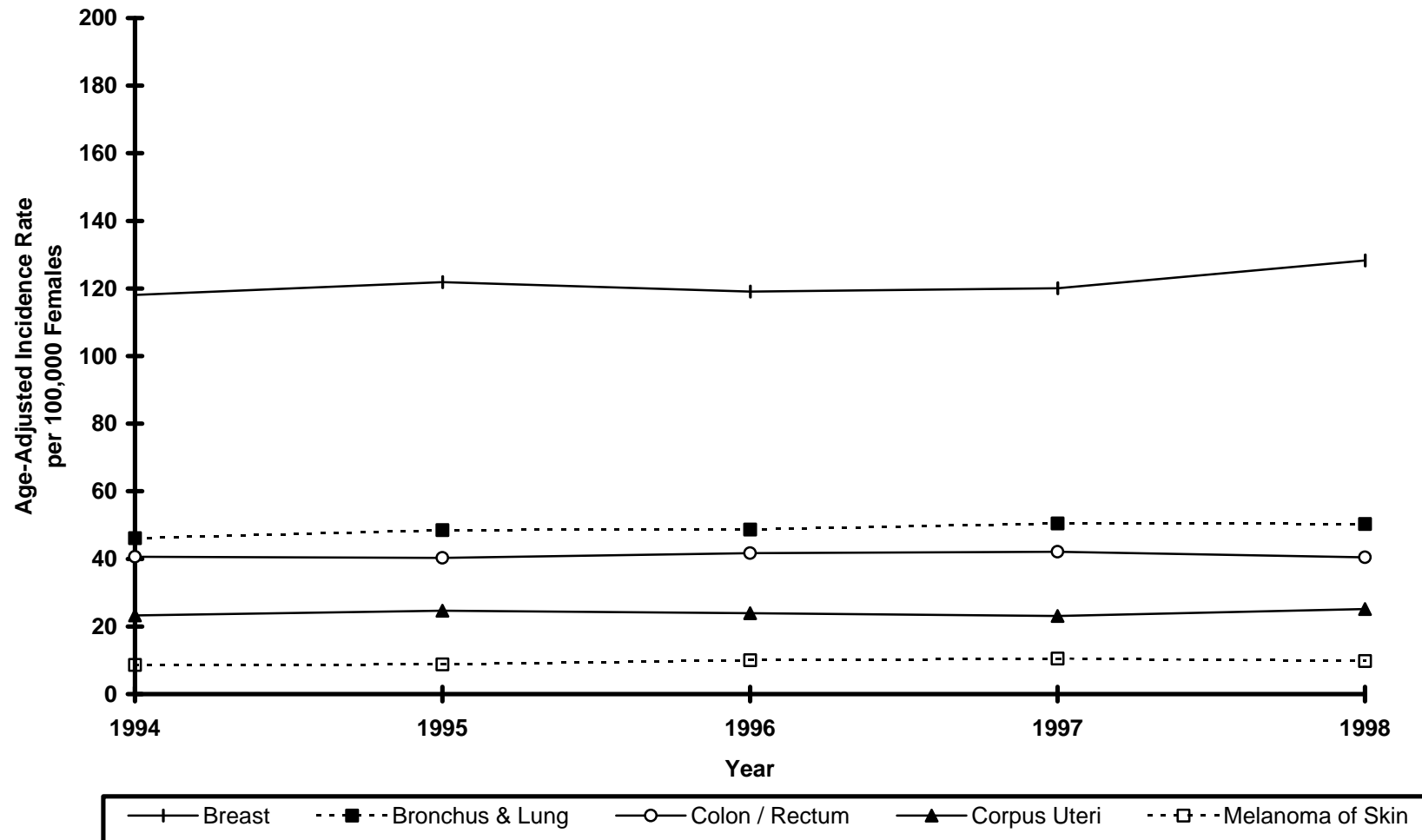


Figure 4A

Massachusetts Cancer Mortality Trends  
for Selected Cancer Types, 1994-1998

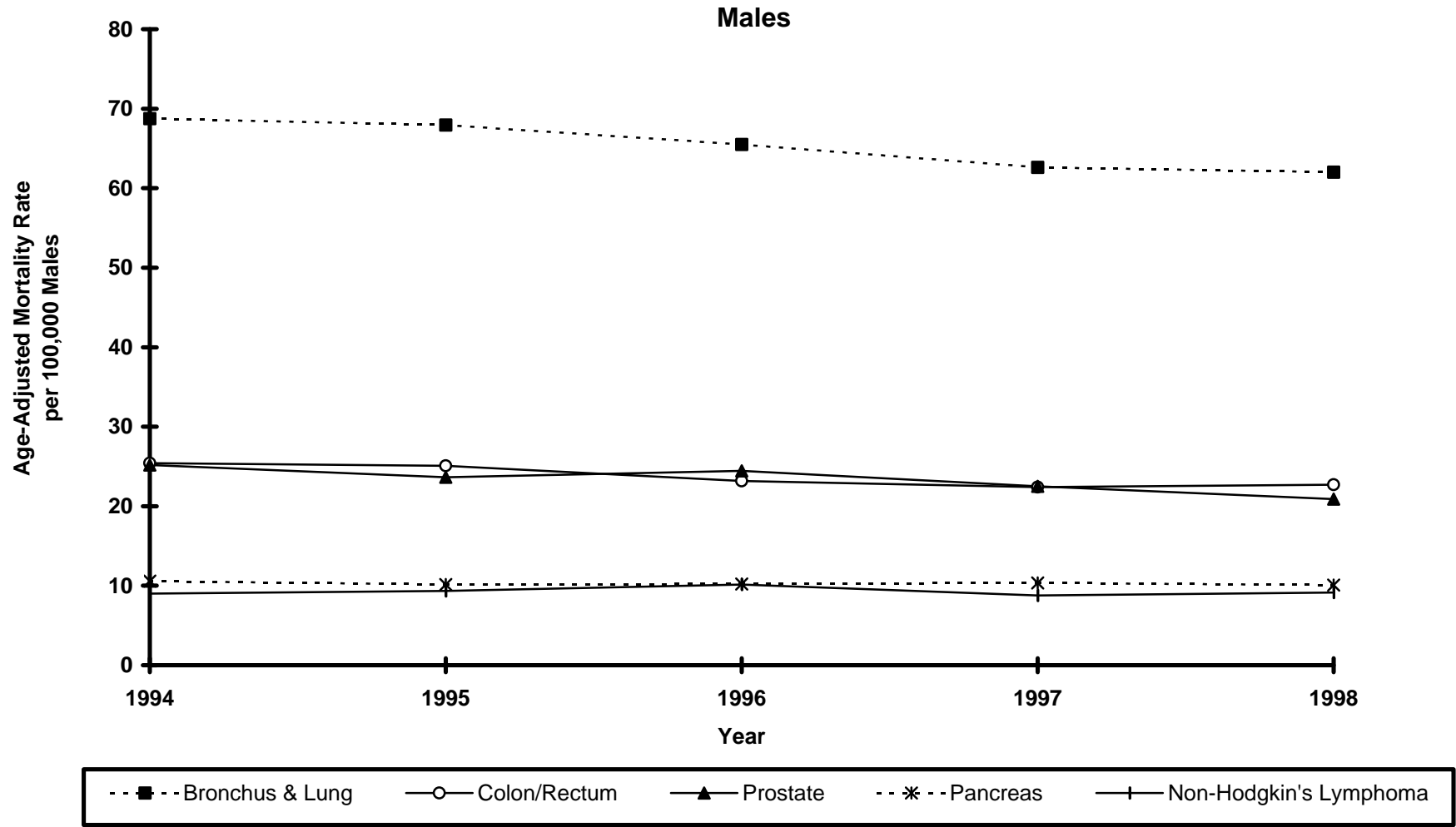


Figure 4B

Massachusetts Cancer Mortality Trends  
for Selected Cancer Types, 1994-1998

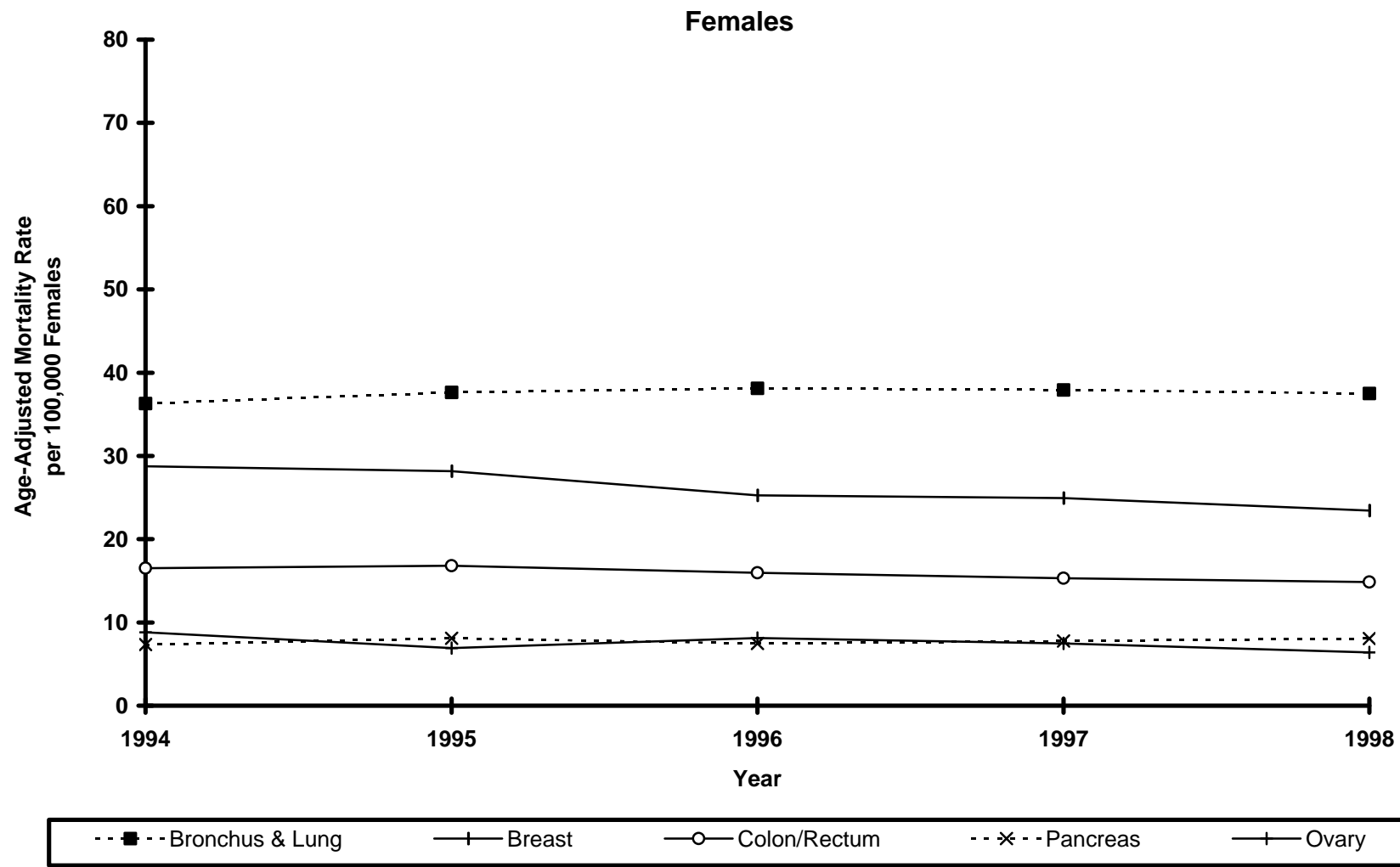


Figure 5

**Bronchus & Lung Cancer Incidence Trends by Sex  
Massachusetts, 1994-1998 and SEER, 1994-1998**

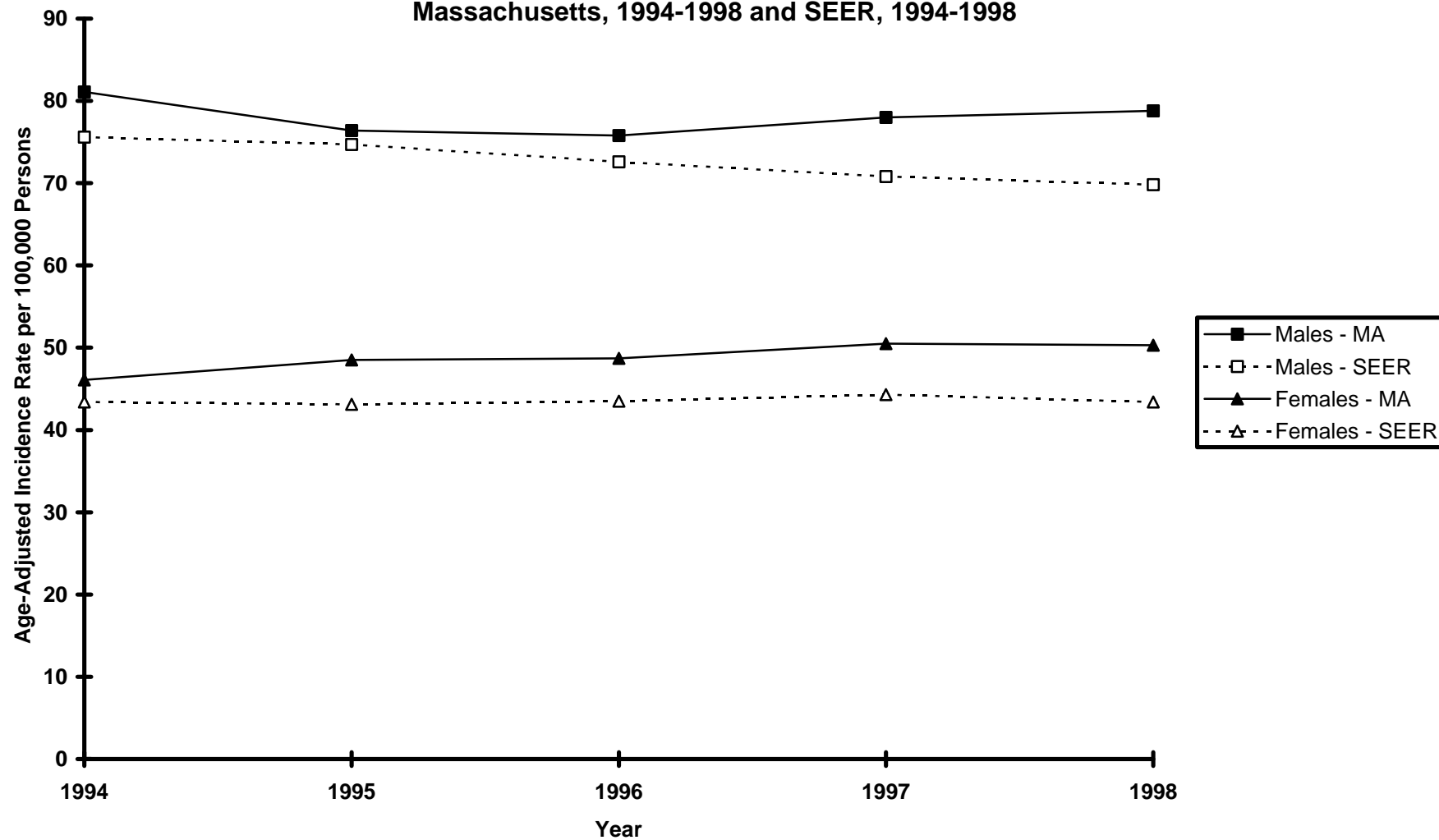


Figure 6

Colon/Rectum Cancer Incidence Trends by Sex  
Massachusetts, 1994-1998 and SEER, 1994-1998

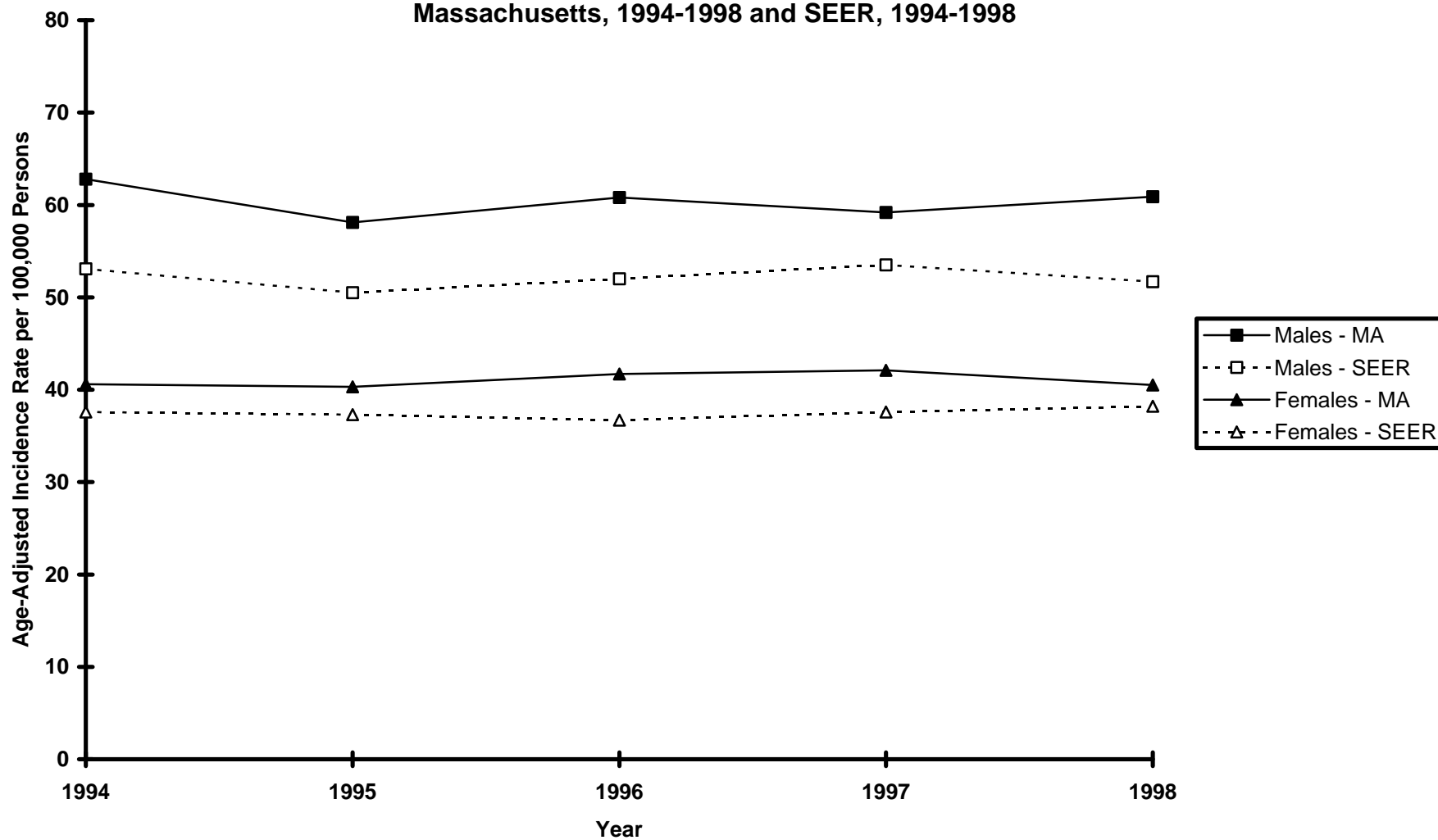
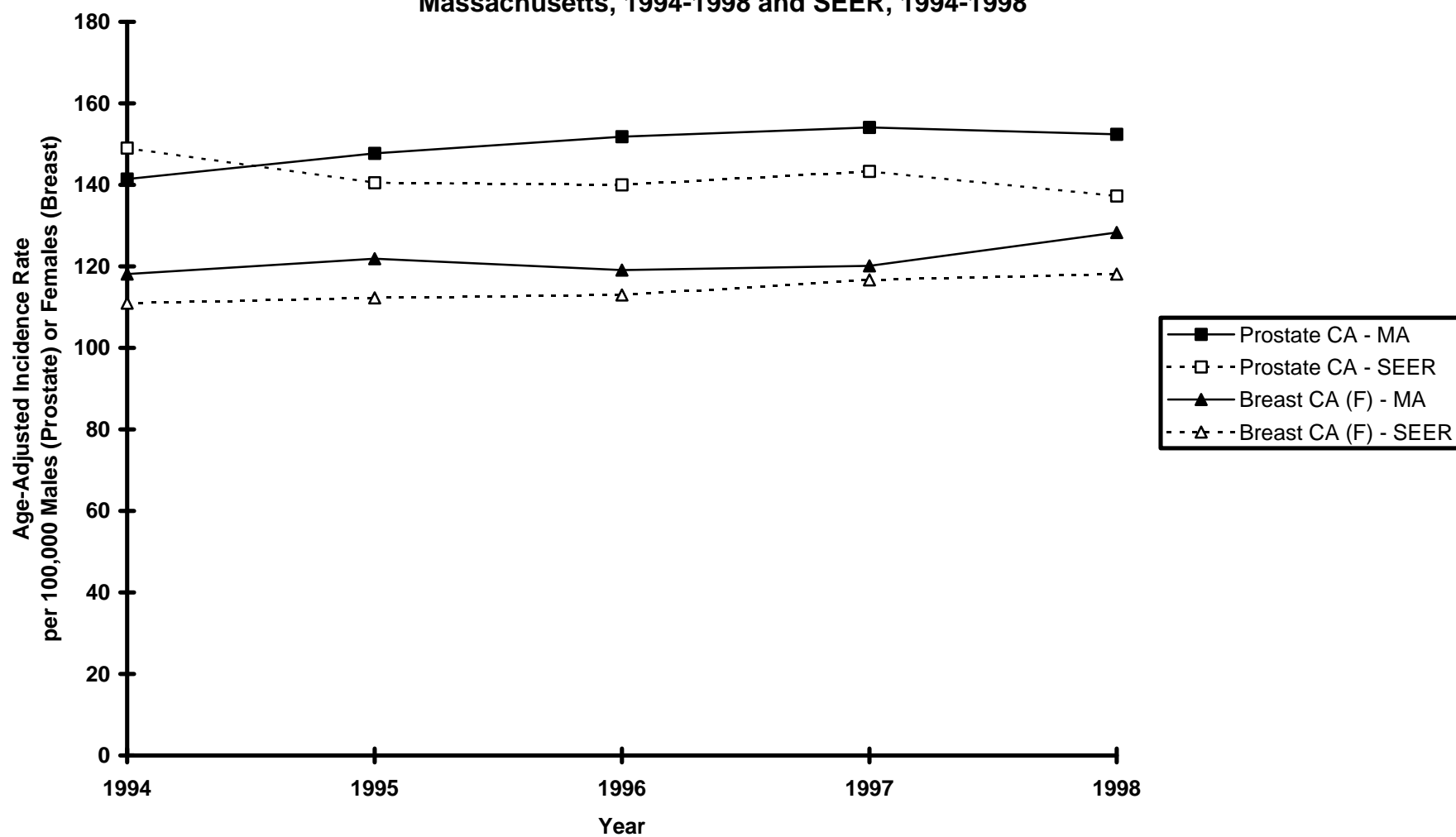


Figure 7

Prostate and Female Breast Cancer Incidence  
Massachusetts, 1994-1998 and SEER, 1994-1998



# **TABLES**

**Table 1.**  
**CANCER INCIDENCE BY SEX**  
**Massachusetts, 1994-1998**

<b><i>Cancer Site / Type</i></b>	<b><i>Males</i></b>		<b><i>Females</i></b>		<b><i>Total</i></b> <sup>1</sup>	
	<b><i>Number</i></b>	<b><i>Percent</i></b>	<b><i>Number</i></b>	<b><i>Percent</i></b>	<b><i>Number</i></b>	<b><i>Percent</i></b>
<b>All Sites</b>	75973	100.0	76157	100.0	152148	100.0
<b>Brain &amp; Central Nervous System</b>	1249	1.6	1019	1.3	2268	1.5
<b>Breast</b>	245	0.3	24232	31.8	24479	16.1
<b>Bronchus &amp; Lung</b>	12076	15.9	9824	12.9	21902	14.4
<b>Cervix Uteri</b>	0	0.0	1487	2.0	1487	1.0
<b>Colon / Rectum</b>	9573	12.6	9746	12.8	19323	12.7
<b>Corpus Uteri &amp; Uterus, NOS</b>	0	0.0	4616	6.1	4616	3.0
<b>Esophagus</b>	1374	1.8	502	0.7	1877	1.2
<b>Hodgkin's Disease</b>	615	0.8	507	0.7	1123	0.7
<b>Kidney &amp; Renal Pelvis</b> <sup>2</sup>	2201	2.9	1429	1.9	3631	2.4
<b>Larynx</b>	1257	1.7	349	0.5	1606	1.1
<b>Leukemia</b>	1661	2.2	1356	1.8	3019	2.0
<b>Liver &amp; Intrahepatic Bile Ducts</b>	806	1.1	353	0.5	1159	0.8
<b>Melanoma of Skin</b>	2391	3.1	1925	2.5	4316	2.8
<b>Multiple Myeloma</b>	708	0.9	671	0.9	1379	0.9
<b>Non-Hodgkin's Lymphoma</b>	3045	4.0	2826	3.7	5872	3.9
<b>Oral Cavity &amp; Pharynx</b>	2434	3.2	1200	1.6	3634	2.4
<b>Ovary</b>	0	0.0	2847	3.7	2847	1.9
<b>Pancreas</b>	1501	2.0	1687	2.2	3188	2.1
<b>Prostate</b>	22714	29.9	0	0.0	22715	14.9
<b>Stomach</b>	1614	2.1	1054	1.4	2669	1.8
<b>Testis</b>	946	1.2	0	0.0	947	0.6
<b>Thyroid</b>	488	0.6	1341	1.8	1829	1.2
<b>Urinary Bladder</b>	3809	5.0	1556	2.0	5365	3.5
<b>Other Sites</b>	5266	6.9	5630	7.4	10897	7.2

<sup>1</sup> Totals also include persons classified as transsexuals or hermaphrodites, and persons of unknown sex.

<sup>2</sup> Massachusetts rates for this site include codes 64.9 & 65.9 (ICD-O-2) only for comparability. Massachusetts hospital coding conventions may have assigned some cases to a "not otherwise specified" category.

**Table 2.**  
**AGE-ADJUSTED<sup>1</sup> INCIDENCE RATES<sup>2</sup> FOR SELECTED CANCER SITES BY SEX**  
**Massachusetts Residents, 1994-1998, and SEER Registries, 1994-1998**

<b><i>Cancer Site / Type</i></b>	<b><i>M a l e s</i></b>		<b><i>F e m a l e s</i></b>		<b><i>T o t a l</i></b>	
	<b><i>Massachusetts</i></b>	<b><i>SEER</i></b>	<b><i>Massachusetts</i></b>	<b><i>SEER</i></b>	<b><i>Massachusetts</i></b>	<b><i>SEER</i></b>
<b>All Sites</b>	490.3	468.5	367.6	352.8	416.4	400.5
<b>Brain &amp; Central Nervous System</b>	8.1	7.1	5.5	4.9	6.7	6.0
<b>Breast</b>	1.6	1.0	122.5	114.3	67.6	62.0
<b>Bronchus &amp; Lung</b>	78.8	72.6	49.2	43.5	61.4	56.1
<b>Cervix Uteri</b>	---	---	7.5	7.7	---	---
<b>Colon / Rectum</b>	61.0	52.2	41.3	37.5	49.6	43.9
<b>Corpus Uteri &amp; Uterus, NOS</b>	---	---	24.3	21.9	---	---
<b>Esophagus</b>	9.1	6.5	2.1	1.7	5.2	3.9
<b>Hodgkin's Disease</b>	3.7	2.9	2.7	2.4	3.2	2.7
<b>Kidney &amp; Renal Pelvis<sup>3</sup></b>	14.3	13.1	7.1	6.6	10.3	9.6
<b>Larynx</b>	8.4	6.5	1.9	1.4	4.8	3.7
<b>Leukemia</b>	10.8	13.3	6.9	8.1	8.6	10.4
<b>Liver &amp; Intrahepatic Bile Ducts</b>	5.3	6.3	1.6	2.4	3.2	4.2
<b>Melanoma of Skin</b>	15.0	17.2	9.6	11.7	11.9	14.1
<b>Multiple Myeloma</b>	4.6	5.5	3.2	3.8	3.7	4.5
<b>Non-Hodgkin's Lymphoma</b>	19.0	19.8	13.3	13.0	15.8	16.1
<b>Oral Cavity &amp; Pharynx</b>	15.9	14.8	6.0	5.8	10.4	9.9
<b>Ovary</b>	---	---	13.3	14.5	---	---
<b>Pancreas</b>	9.7	10.2	6.0	7.8	8.4	8.9
<b>Prostate</b>	151.0	142.0	---	---	---	---
<b>Stomach</b>	10.2	10.0	4.4	4.3	6.8	6.8
<b>Testis</b>	5.0	4.7	---	---	---	---
<b>Thyroid</b>	3.0	3.0	7.0	8.2	5.0	5.6
<b>Urinary Bladder<sup>4</sup></b>	24.2	28.8	6.6	7.6	13.9	16.7

<sup>1</sup> age-adjusted to the 1970 U.S. Standard Population

<sup>2</sup> per 100,000

<sup>3</sup> Massachusetts rates for this site include codes 64.9 & 65.9 (ICD-O-2) only for comparability. Massachusetts hospital coding conventions may have assigned some cases to a "not otherwise specified" category.

<sup>4</sup> Massachusetts rates include invasive bladder cancer only.

**Table 3.**  
**AGE-ADJUSTED<sup>1</sup> MORTALITY RATES<sup>2</sup> FOR SELECTED CANCER SITES BY SEX**  
**Massachusetts Residents, 1994-1998, and United States, 1994-1998**

<b><u>Cancer Site / Type</u></b>	<b><i>M a l e s</i></b>		<b><i>F e m a l e s</i></b>		<b><i>T o t a l</i></b>	
	<b><u>Massachusetts</u></b>	<b><u>U.S.</u></b>	<b><u>Massachusetts</u></b>	<b><u>U.S.</u></b>	<b><u>Massachusetts</u></b>	<b><u>U.S.</u></b>
All Sites	216.1	206.0	147.8	138.6	174.4	166.2
Brain & Central Nervous System	5.0	5.0	3.1	3.4	3.9	4.1
Breast	0.3	0.3	26.1	24.2	14.9	13.5
Bronchus & Lung	65.3	68.0	37.5	34.3	48.8	48.7
Cervix Uteri	---	---	2.0	2.7	---	---
Colon / Rectum	23.7	20.5	15.9	14.1	19.1	16.9
Corpus Uteri & Uterus, NOS	---	---	3.3	3.3	---	---
Esophagus	7.7	6.3	1.7	1.5	4.3	3.6
Hodgkin's Disease	0.6	0.5	0.4	0.4	0.5	0.4
Kidney & Renal Pelvis	5.1	5.0	2.2	2.3	3.4	3.5
Larynx	2.5	2.3	0.5	0.5	1.4	1.3
Leukemia	7.7	8.2	4.5	4.7	5.8	6.2
Liver & Intrahepatic Bile Ducts	5.9	5.2	2.0	2.3	3.7	3.6
Melanoma of Skin	3.6	3.2	1.9	1.5	2.6	2.2
Multiple Myeloma	3.7	3.8	2.4	2.6	2.9	3.1
Non-Hodgkin's Lymphoma	9.3	8.6	5.9	5.6	7.4	6.9
Oral Cavity & Pharynx	4.0	3.9	1.4	1.4	2.6	2.6
Ovary	---	---	7.5	7.5	---	---
Pancreas	10.3	9.7	7.8	7.2	8.9	8.3
Prostate	23.3	23.7	---	---	---	---
Stomach	6.7	5.7	2.9	2.7	4.5	4.0
Testis	0.3	0.2	---	---	---	---
Thyroid	0.4	0.3	0.3	0.4	0.4	0.3
Urinary Bladder	6.6	5.5	2.0	1.7	3.7	3.2

<sup>1</sup> age-adjusted to the 1970 U.S. Standard Population

<sup>2</sup> per 100,000

# **APPENDICES**

# **APPENDIX I** **ICD CODES USED FOR THIS REPORT**

<b>Cancer Site / Type</b>	<b>Codes</b>	
	<b>ICD-O-2*</b>	<b>ICD-9**</b>
<b>Brain &amp; Central Nervous System</b>	C70.0 - C72.9 See <b>List I</b> (following) for histology codes.	191.0 - 192.9 (no <i>in situ</i> code)
<b>Breast</b>	C50.0 - C50.9 except 9590 - 9989	174.0 - 174.9, 175.0, 175.9 except 233.0
<b>Bronchus &amp; Lung</b>	C34.0 - C34.9 except 9050 - 9053, 9590 - 9989	162.2 - 162.9 except 231.2
<b>Cervix Uteri</b>	C53.0 - C53.9 except 9590 - 9989	180.0 - 180.9 except 233.1
<b>Colon/Rectum</b>	C18.0 - C18.9, C19.9, C20.9, C26.0 except 9590 - 9989	153.0 - 153.9, 154.0, 154.1, 159.0 except 230.3, 230.4
<b>Corpus Uteri &amp; Uterus, NOS</b>	C54.0 - C54.9, C55.9 except 9590 - 9989	179, 182.0 - 182.8 except 233.2
<b>Esophagus</b>	C15.0 - C15.9 except 9590 - 9989	150.0 - 150.9 except 230.1
<b>Hodgkin's Disease</b>	C00.0 - C80.9 (includes O9650 - O9667)	201.0 - 201.9 (no <i>in situ</i> code)
<b>Kidney &amp; Renal Pelvis</b>	C64.9, C65.9 except 9590 - 9989	189.0, 189.1 (no <i>in situ</i> code)
<b>Larynx</b>	C32.0 - C32.9 except 9590 - 9989	161.0 - 161.9 except 231.0
<b>Leukemia</b>	C00.0 - C80.9 (includes O9800 - O9941)	202.4, 203.1, 204.0 - 208.9 (no <i>in situ</i> code)

\* *International Classification of Diseases for Oncology, 2nd Ed. (1990)* for incidence data

\*\* *International Classification of Diseases, Ninth Revision, Clinical Modification (1980)* for mortality data

<b>Cancer Site / Type</b>	<b>..... Codes .....</b>	
	<b>ICD-O-2*</b>	<b>ICD-9**</b>
<b>Liver and Intra-hepatic Bile Ducts</b>	C22.0, C22.1 except 9590 - 9989	155.0, 155.1 except 230.8
<b>Melanoma of Skin</b>	C44.0 - C44.9 (includes O8720 - O8790)	172.0 - 172.9 (no <i>in situ</i> code)
<b>Multiple Myeloma</b>	C00.0 - C80.9 (includes O9731, O9732)	203.0 (no <i>in situ</i> code)
<b>Non-Hodgkin's Lymphoma</b>	C00.0 - C80.9 See <b>List II</b> (following) for histology codes.	200.0 - 200.8, 202.0 - 202.2, 202.8, 202.9 (no <i>in situ</i> code)
<b>Oral Cavity &amp; Pharynx</b>	C00.0 - C14.8 except 9590 - 9989	140.0 - 149.9 except 230.0
<b>Ovary</b>	C56.9 except 9590 - 9989	183.0 (no <i>in situ</i> code)
<b>Pancreas</b>	C25.0 - C25.9 except 9590 - 9989	157.0 - 157.9 (no <i>in situ</i> code)
<b>Prostate</b>	C61.9 except 9590 - 9989	185.0 except 233.4
<b>Stomach</b>	C16.0 - C16.9 except 9590 - 9989	151.0 - 151.9 except 230.2
<b>Testis</b>	C62.0 - C62.9 except 9590 - 9989	186.0 - 186.9 (no <i>in situ</i> code)
<b>Thyroid</b>	C73.9 except 9590 - 9989	193.0 (no <i>in situ</i> code)
<b>Urinary Bladder</b>	C67.0 - C67.9 except 9590 - 9989	188.0 - 188.9 except 233.7

\* *International Classification of Diseases for Oncology, 2nd Ed. (1990)* for incidence data

\*\* *International Classification of Diseases, Ninth Revision, Clinical Modification (1980)* for mortality data

**List I -- Histology Codes for Brain and Central Nervous System Neoplasms**

ICD-O      O9370, O9380, O9381, O9382, O9390, O9391, O9392, O9400, O9401,  
O9410, O9411, O9420, O9421, O9422, O9423, O9424, O9430, O9440,  
O9441, O9442, O9443, O9450, O9451, O9460, O9470, O9471, O9472,  
O9473, O9480, O9481, O9490, O9500, O9501, O9502, O9503, O9530,  
O9539, O9540, O9560, O9561

**List II -- Histology Codes for Non-Hodgkin's Lymphomas**

ICD-O      O9590 - O9595, O9670 - O9717

**APPENDIX II**  
**ANNUAL AGE-ADJUSTED<sup>1</sup> CANCER INCIDENCE RATES<sup>2</sup>**  
**by Primary Cancer Site, 1994-1998**  
**Massachusetts, MALES**

<b>Site or Type</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>
<b>All Sites</b>	478.7	481.3	492.2	492.4	492.7
<b>Brain &amp; Central Nervous System</b>	9.8	7.2	7.3	8.3	7.9
<b>Breast</b>	1.6	1.4	2.0	1.4	1.4
<b>Bronchus &amp; Lung</b>	81.1	76.4	75.8	78.0	78.8
<b>Colon / Rectum</b>	62.8	58.1	60.8	59.2	60.9
<b>Esophagus</b>	9.6	9.8	8.7	8.4	8.5
<b>Hodgkin's Disease</b>	3.9	3.5	4.3	3.1	3.7
<b>Kidney &amp; Renal Pelvis</b>	14.6	14.8	13.5	14.2	13.9
<b>Larynx</b>	7.7	9.1	8.8	8.5	7.3
<b>Leukemia</b>	9.5	10.4	11.7	11.1	10.7
<b>Liver &amp; Intrahepatic Bile Ducts</b>	4.4	4.4	5.0	6.0	6.0
<b>Melanoma of Skin</b>	12.5	14.0	16.0	15.7	16.1
<b>Multiple Myeloma</b>	4.1	5.0	5.0	4.5	4.1
<b>Non-Hodgkin's Lymphoma</b>	18.0	19.5	20.0	18.8	18.0
<b>Oral Cavity &amp; Pharynx</b>	16.7	15.8	16.3	14.2	15.8
<b>Pancreas</b>	8.5	8.7	8.6	11.3	10.9
<b>Prostate</b>	141.4	147.7	151.8	154.1	152.4
<b>Stomach</b>	9.9	10.5	9.8	10.8	9.7
<b>Testis</b>	5.4	5.3	4.7	4.3	5.5
<b>Thyroid</b>	2.3	2.9	3.5	2.7	3.3
<b>Urinary Bladder</b>	21.6	24.0	25.0	25.3	23.8

<sup>1</sup> age-adjusted to the 1970 U.S. Standard Population

<sup>2</sup> per 100,000 males

**ANNUAL AGE-ADJUSTED<sup>1</sup> CANCER INCIDENCE RATES<sup>2</sup>**  
**by Primary Cancer Site, 1994-1998**  
**Massachusetts, FEMALES**

<b>Site or Type</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>
<b>All Sites</b>	355.7	367.7	364.6	371.1	380.5
<b>Brain &amp; Central Nervous System</b>	6.5	5.2	5.1	5.6	5.1
<b>Breast</b>	118.1	121.9	119.1	120.1	128.3
<b>Bronchus &amp; Lung</b>	46.1	48.5	48.7	50.5	50.3
<b>Cervix Uteri</b>	7.7	7.7	8.0	7.8	6.3
<b>Colon / Rectum</b>	40.6	40.3	41.7	42.1	40.5
<b>Corpus Uteri &amp; Uterus, NOS</b>	23.3	24.7	23.9	23.1	25.2
<b>Esophagus</b>	2.1	2.1	2.0	2.0	2.2
<b>Hodgkin's Disease</b>	3.1	2.4	2.4	2.8	3.1
<b>Kidney &amp; Renal Pelvis</b>	6.9	7.6	6.2	6.1	8.3
<b>Larynx</b>	2.1	2.0	2.1	1.7	1.6
<b>Leukemia</b>	6.3	7.2	7.2	6.3	7.3
<b>Liver &amp; Intrahepatic Bile Ducts</b>	1.4	1.7	1.3	1.7	2.0
<b>Melanoma of Skin</b>	8.6	8.8	10.0	10.5	9.8
<b>Multiple Myeloma</b>	3.2	3.1	3.3	3.1	3.1
<b>Non-Hodgkin's Lymphoma</b>	11.9	13.6	13.6	13.8	13.1
<b>Oral Cavity &amp; Pharynx</b>	6.2	5.5	6.1	6.1	5.7
<b>Ovary</b>	14.5	15.9	14.8	14.0	14.0
<b>Pancreas</b>	6.1	7.3	7.1	8.3	7.8
<b>Stomach</b>	3.7	4.5	4.1	4.8	4.5
<b>Thyroid</b>	6.5	6.3	6.4	7.1	8.5
<b>Urinary Bladder</b>	5.5	6.7	7.2	6.7	6.8

<sup>1</sup> age-adjusted to the 1970 U.S. Standard Population

<sup>2</sup> per 100,000 females

**ANNUAL AGE-ADJUSTED<sup>1</sup> CANCER INCIDENCE RATES<sup>2</sup>**  
**by Primary Cancer Site, 1994-1998**  
**Massachusetts, TOTAL**

Site or Type	1994	1995	1996	1997	1998
<b>All Sites</b>	404.6	412.7	415.3	419.6	425.4
<b>Brain &amp; Central Nervous System</b>	8.0	6.1	6.1	6.8	6.4
<b>Breast</b>	65.5	67.3	65.9	66.3	70.2
<b>Bronchus &amp; Lung</b>	60.8	60.1	59.8	61.9	62.0
<b>Cervix Uteri</b>	4.1	4.1	4.2	4.1	3.3
<b>Colon / Rectum</b>	50.1	47.7	49.6	49.3	49.3
<b>Corpus Uteri &amp; Uterus, NOS</b>	12.8	13.5	13.1	12.7	13.7
<b>Esophagus</b>	5.4	5.5	5.0	4.8	5.0
<b>Hodgkin's Disease</b>	3.5	2.9	3.4	3.0	3.4
<b>Kidney &amp; Renal Pelvis</b>	10.3	10.8	9.4	9.7	10.7
<b>Larynx</b>	4.5	5.2	5.1	4.7	4.2
<b>Leukemia</b>	7.7	8.6	9.2	8.3	8.7
<b>Liver &amp; Intrahepatic Bile Ducts</b>	2.7	2.9	3.0	3.6	3.8
<b>Melanoma of Skin</b>	10.3	10.9	12.4	12.7	12.5
<b>Multiple Myeloma</b>	3.5	3.8	4.0	3.7	3.5
<b>Non-Hodgkin's Lymphoma</b>	14.6	16.2	16.5	16.0	15.2
<b>Oral Cavity &amp; Pharynx</b>	10.9	10.2	10.8	9.7	10.3
<b>Ovary</b>	7.9	8.6	8.0	7.6	7.6
<b>Pancreas</b>	7.2	8.0	7.7	9.6	9.2
<b>Prostate</b>	60.5	64.0	65.9	67.1	67.1
<b>Stomach</b>	6.3	7.0	6.5	7.4	6.7
<b>Testis</b>	2.7	2.6	2.3	2.1	2.7
<b>Thyroid</b>	4.4	4.7	5.0	5.0	6.0
<b>Urinary Bladder</b>	12.2	13.8	14.6	14.4	13.9

<sup>1</sup> age-adjusted to the 1970 U.S. Standard Population

<sup>2</sup> per 100,000 residents, except for single-sex sites -- per 100,000 females for Cervix Uteri; Corpus Uteri & Uterus, NOS; and Ovary; per 100,000 males for Prostate and Testis

**APPENDIX III**  
**ANNUAL AGE-ADJUSTED<sup>1</sup> CANCER MORTALITY RATES<sup>2</sup>**  
**by Primary Cancer Site, 1994-1998**  
**Massachusetts, MALES**

<b>Site or Type</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>
<b>All Sites</b>	224.6	223.1	219.8	208.8	205.1
<b>Brain &amp; Central Nervous System</b>	5.0	4.7	5.7	4.4	5.3
<b>Breast</b>	0.4	0.3	0.3	0.3	0.2
<b>Bronchus &amp; Lung</b>	68.7	67.9	65.5	62.6	62.0
<b>Colon / Rectum</b>	25.4	25.1	23.2	22.4	22.7
<b>Esophagus</b>	7.2	8.1	7.5	7.5	7.9
<b>Hodgkin's Disease</b>	0.6	0.6	0.8	0.2	0.6
<b>Kidney &amp; Renal Pelvis</b>	4.9	5.2	5.3	5.2	4.9
<b>Larynx</b>	2.7	2.4	2.7	2.3	2.5
<b>Leukemia</b>	7.5	8.4	8.3	7.3	7.2
<b>Liver &amp; Intrahepatic Bile Ducts</b>	5.5	5.9	6.0	6.2	5.7
<b>Melanoma of Skin</b>	3.9	2.7	3.7	3.8	3.9
<b>Multiple Myeloma</b>	4.3	3.8	3.6	3.8	3.1
<b>Non-Hodgkin's Lymphoma</b>	9.0	9.3	10.2	8.8	9.1
<b>Oral Cavity &amp; Pharynx</b>	4.2	4.8	3.5	3.8	3.7
<b>Pancreas</b>	10.6	10.2	10.2	10.4	10.1
<b>Prostate</b>	25.2	23.6	24.4	22.5	20.9
<b>Stomach</b>	7.2	7.2	7.0	6.2	6.2
<b>Testis</b>	0.2	0.3	0.4	0.3	0.2
<b>Thyroid</b>	0.4	0.4	0.3	0.5	0.3
<b>Urinary Bladder</b>	6.5	6.3	7.3	6.9	6.0

<sup>1</sup> age-adjusted to the 1970 U.S. Standard Population

<sup>2</sup> per 100,000 males

**ANNUAL AGE-ADJUSTED<sup>1</sup> CANCER MORTALITY RATES<sup>2</sup>**  
**by Primary Cancer Site, 1994-1998**  
**Massachusetts, FEMALES**

Site or Type	1994	1995	1996	1997	1998
<b>All Sites</b>	151.7	152.3	147.8	146.7	140.7
<b>Brain &amp; Central Nervous System</b>	3.1	3.4	2.7	3.1	3.2
<b>Breast</b>	28.8	28.2	25.3	24.9	23.4
<b>Bronchus &amp; Lung</b>	36.3	37.6	38.1	37.9	37.5
<b>Cervix Uteri</b>	1.9	2.0	2.2	2.0	2.2
<b>Colon / Rectum</b>	16.5	16.8	16.0	15.3	14.9
<b>Corpus Uteri &amp; Uterus, NOS</b>	3.2	3.4	3.6	3.2	3.1
<b>Esophagus</b>	1.9	1.6	1.8	1.5	1.9
<b>Hodgkin's Disease</b>	0.6	0.4	0.4	0.4	0.4
<b>Kidney &amp; Renal Pelvis</b>	2.4	2.4	2.4	1.9	2.1
<b>Larynx</b>	0.6	0.5	0.4	0.6	0.4
<b>Leukemia</b>	4.8	4.9	4.5	4.2	4.0
<b>Liver &amp; Intrahepatic Bile Ducts</b>	1.7	2.3	1.7	2.4	1.7
<b>Melanoma of Skin</b>	1.9	2.1	2.0	2.0	1.6
<b>Multiple Myeloma</b>	2.4	2.6	2.5	2.3	2.5
<b>Non-Hodgkin's Lymphoma</b>	6.6	5.7	5.6	6.4	5.5
<b>Oral Cavity &amp; Pharynx</b>	1.2	1.7	1.4	1.2	1.6
<b>Ovary</b>	8.8	6.9	8.1	7.5	6.4
<b>Pancreas</b>	7.4	8.1	7.5	7.8	8.1
<b>Stomach</b>	3.1	3.0	2.9	2.8	2.8
<b>Thyroid</b>	0.3	0.3	0.3	0.4	0.3
<b>Urinary Bladder</b>	2.2	2.0	1.9	2.2	1.6

<sup>1</sup> age-adjusted to the 1970 U.S. Standard Population

<sup>2</sup> per 100,000 females

**ANNUAL AGE-ADJUSTED<sup>1</sup> CANCER MORTALITY RATES<sup>2</sup>**  
**by Primary Cancer Site, 1994-1998**  
**Massachusetts, TOTAL**

Site or Type	1994	1995	1996	1997	1998
<b>All Sites</b>	180.2	179.9	175.8	170.6	165.9
<b>Brain &amp; Central Nervous System</b>	3.9	3.9	4.0	3.7	4.2
<b>Breast</b>	16.4	16.1	14.5	14.2	13.3
<b>Bronchus &amp; Lung</b>	49.6	50.1	49.1	47.9	47.5
<b>Cervix Uteri</b>	1.9	2.0	2.2	2.0	2.2
<b>Colon / Rectum</b>	20.1	20.1	18.9	18.3	18.0
<b>Corpus Uteri &amp; Uterus, NOS</b>	3.2	3.4	3.6	3.2	3.1
<b>Esophagus</b>	4.2	4.4	4.3	4.1	4.6
<b>Hodgkin's Disease</b>	0.6	0.5	0.6	0.4	0.5
<b>Kidney &amp; Renal Pelvis</b>	3.5	3.6	3.6	3.3	3.3
<b>Larynx</b>	1.5	1.3	1.4	1.3	1.3
<b>Leukemia</b>	5.9	6.3	6.0	5.5	5.3
<b>Liver &amp; Intrahepatic Bile Ducts</b>	3.3	3.8	3.6	4.1	3.5
<b>Melanoma of Skin</b>	2.8	2.3	2.8	2.7	2.6
<b>Multiple Myeloma</b>	3.2	3.0	2.9	2.9	2.8
<b>Non-Hodgkin's Lymphoma</b>	7.6	7.3	7.5	7.4	7.0
<b>Oral Cavity &amp; Pharynx</b>	2.5	3.0	2.3	2.4	2.5
<b>Ovary</b>	8.8	6.9	8.1	7.5	6.4
<b>Pancreas</b>	8.9	9.0	8.6	8.9	9.0
<b>Prostate</b>	25.2	23.6	24.4	22.5	20.9
<b>Stomach</b>	4.8	4.7	4.6	4.2	4.2
<b>Testis</b>	0.2	0.3	0.4	0.3	0.2
<b>Thyroid</b>	0.4	0.3	0.3	0.4	0.3
<b>Urinary Bladder</b>	3.9	3.6	3.9	4.0	3.3

<sup>1</sup> age-adjusted to the 1970 U.S. Standard Population

<sup>2</sup> per 100,000 residents, except for single-sex sites -- per 100,000 females for Cervix Uteri; Corpus Uteri & Uterus, NOS; and Ovary; per 100,000 males for Prostate

## APPENDIX IV

### AGE-SPECIFIC INCIDENCE RATES<sup>1</sup> for Selected Cancer Sites by Sex Massachusetts Residents, 1994-1998

<u>Cancer Site / Type</u>	<u>Age Group</u>	<u>Males</u>	<u>Females</u>	<u>Total</u>
<b>All Sites</b>	0-19	17.15	16.06	16.62
	20-44	78.55	127.31	103.11
	45-64	739.63	715.90	727.36
	65-74	2812.09	1630.77	2148.58
	75-84	3312.23	1984.33	2474.69
	85+	2716.74	1587.01	1876.97
<b>Brain &amp; Central Nervous System</b>	0-19	2.75	2.46	2.60
	20-44	4.17	3.14	3.65
	45-64	12.92	8.32	10.54
	65-74	31.08	19.49	24.57
	75-84	31.84	19.77	24.23
	85+	15.86	9.53	11.15
<b>Breast</b>	0-19	0.00	0.00	0.00
	20-44	0.18	48.45	24.49
	45-64	2.50	285.71	149.00
	65-74	8.01	480.33	273.29
	75-84	12.28	507.34	324.52
	85+	12.41	358.89	269.96
<b>Bronchus &amp; Lung</b>	0-19	0.05	0.13	0.09
	20-44	4.96	4.90	4.93
	45-64	118.09	92.22	104.71
	65-74	495.34	287.16	378.41
	75-84	564.76	281.47	386.08
	85+	365.54	120.74	183.57
<b>Cervix Uteri</b>	0-19	----	0.03	----
	20-44	----	9.73	----
	45-64	----	15.38	----
	65-74	----	16.36	----
	75-84	----	13.93	----
	85+	----	11.43	----
<b>Colon / Rectum</b>	0-19	0.00	0.13	0.06
	20-44	4.84	4.50	4.67
	45-64	76.88	56.34	66.26
	65-74	357.94	219.15	279.99
	75-84	533.11	378.18	435.39
	85+	522.79	378.41	415.47

<sup>1</sup> per 100,000

**AGE-SPECIFIC INCIDENCE RATES<sup>1</sup> for Selected Cancer Sites by Sex**  
**Massachusetts Residents, 1994-1998**

<u><b>Cancer Site / Type</b></u>	<u><b>Age Group</b></u>	<u><b>Males</b></u>	<u><b>Females</b></u>	<u><b>Total</b></u>
<b>Corpus Uteri &amp; Uterus, NOS</b>	0-19	----	0.05	----
	20-44	----	5.01	----
	45-64	----	58.03	----
	65-74	----	104.85	----
	75-84	----	100.97	----
	85+	----	55.49	----
<b>Esophagus</b>	0-19	0.00	0.00	0.00
	20-44	0.64	0.13	0.38
	45-64	16.74	2.67	9.46
	65-74	51.00	12.50	29.38
	75-84	51.60	18.64	30.82
	85+	49.66	21.20	28.50
<b>Hodgkin's Disease</b>	0-19	1.51	1.24	1.38
	20-44	5.55	4.44	4.99
	45-64	3.91	2.24	3.05
	65-74	5.80	4.11	4.85
	75-84	4.80	4.38	4.53
	85+	6.21	3.81	4.43
<b>Kidney &amp; Renal Pelvis</b>	0-19	0.68	0.73	0.71
	20-44	2.64	1.43	2.03
	45-64	27.26	13.04	19.91
	65-74	67.86	37.42	50.76
	75-84	88.82	36.84	56.04
	85+	50.35	24.29	30.98
<b>Larynx</b>	0-19	0.00	0.00	0.00
	20-44	0.92	0.17	0.54
	45-64	17.17	4.48	10.60
	65-74	45.10	9.95	25.36
	75-84	40.29	7.19	19.41
	85+	27.59	1.67	8.32
<b>Leukemia</b>	0-19	4.08	4.03	4.06
	20-44	3.30	2.55	2.92
	45-64	14.04	9.24	11.56
	65-74	42.78	23.27	31.82
	75-84	69.83	33.25	46.76
	85+	62.76	37.15	43.72

<sup>1</sup> per 100,000

**AGE-SPECIFIC INCIDENCE RATES<sup>1</sup> for Selected Cancer Sites by Sex**  
**Massachusetts Residents, 1994-1998**

<b><u>Cancer Site / Type</u></b>	<b><u>Age Group</u></b>	<b><u>Males</u></b>	<b><u>Females</u></b>	<b><u>Total</u></b>
<b>Liver &amp; Intrahepatic Bile Ducts</b>	0-19	0.22	0.23	0.22
	20-44	0.93	0.17	0.55
	45-64	9.47	2.24	5.73
	65-74	27.61	9.37	17.37
	75-84	29.54	11.34	18.06
	85+	24.14	10.72	14.16
<b>Melanoma of Skin</b>	0-19	0.32	0.48	0.40
	20-44	6.44	7.96	7.20
	45-64	27.95	19.06	23.35
	65-74	60.17	27.96	42.08
	75-84	84.79	34.82	53.27
	85+	79.32	31.67	43.90
<b>Multiple Myeloma</b>	0-19	0.00	0.00	0.00
	20-44	0.31	0.33	0.32
	45-64	7.27	5.98	6.60
	65-74	22.55	15.54	18.61
	75-84	40.67	22.58	29.26
	85+	28.97	15.48	18.94
<b>Non-Hodgkin's Lymphoma</b>	0-19	1.77	1.09	1.44
	20-44	8.87	5.06	6.95
	45-64	30.02	20.78	25.24
	65-74	77.97	62.25	69.14
	75-84	114.14	84.58	95.49
	85+	119.32	65.97	79.66
<b>Oral Cavity &amp; Pharynx</b>	0-19	0.27	0.33	0.30
	20-44	3.77	1.51	2.63
	45-64	35.35	12.15	23.35
	65-74	69.54	25.99	45.08
	75-84	70.40	30.21	45.05
	85+	60.00	26.43	35.05
<b>Ovary</b>	0-19	----	0.84	----
	20-44	----	7.46	----
	45-64	----	32.28	----
	65-74	----	54.52	----
	75-84	----	52.90	----
	85+	----	37.39	----

<sup>1</sup> per 100,000

**AGE-SPECIFIC INCIDENCE RATES<sup>1</sup> for Selected Cancer Sites by Sex**  
**Massachusetts Residents, 1994-1998**

<b><u>Cancer Site / Type</u></b>	<b><u>Age Group</u></b>	<b><u>Males</u></b>	<b><u>Females</u></b>	<b><u>Total</u></b>
<b>Pancreas</b>	0-19	0.00	0.00	0.00
	20-44	0.84	0.44	0.64
	45-64	15.23	10.07	12.56
	65-74	55.11	45.23	49.56
	75-84	66.76	57.84	61.14
	85+	79.32	63.35	67.45
<b>Prostate</b>	0-19	0.05	----	----
	20-44	1.14	----	----
	45-64	225.65	----	----
	65-74	1053.90	----	----
	75-84	939.42	----	----
	85+	606.94	----	----
<b>Stomach</b>	0-19	0.02	0.03	0.02
	20-44	1.24	0.82	1.03
	45-64	14.60	5.89	10.10
	65-74	51.74	21.38	34.69
	75-84	84.98	39.42	56.25
	85+	108.97	47.15	63.02
<b>Testis</b>	0-19	0.87	----	----
	20-44	12.16	----	----
	45-64	4.27	----	----
	65-74	1.58	----	----
	75-84	1.73	----	----
	85+	0.00	----	----
<b>Thyroid</b>	0-19	0.17	0.68	0.42
	20-44	3.11	10.86	7.01
	45-64	5.92	11.88	9.00
	65-74	7.69	10.20	9.10
	75-84	5.56	10.11	8.43
	85+	4.14	6.67	6.02
<b>Urinary Bladder</b>	0-19	0.00	0.03	0.01
	20-44	1.45	0.57	1.01
	45-64	30.68	9.45	19.70
	65-74	133.08	36.92	79.07
	75-84	224.64	56.50	118.59
	85+	242.78	61.68	108.16

<sup>1</sup> per 100,000

## REFERENCES

- Devesa SS, Blot WJ, Stone BJ, *et al.*: "Recent Cancer Trends in the United States", *Journal of the National Cancer Institute*, 87(3):175-182, 1995.
- Ries LAG, Eisner MP, Kosary CL, Hankey BF, Miller BA, Clegg L, Edwards, BK (eds): *SEER Cancer Statistics Review, 1973-1998*, National Cancer Institute, Bethesda, MD, 2001.
- Ries LAG, Wingo PA, Miller DS, *et. al.*: "The Annual Report to the Nation on the Status of Cancer, 1973-1997, With a Special Section on Colorectal Cancer", *Cancer*, 88(10):2398-2424, 2000.
- Troisi RJ, Freedman AN, Devesa SS: "Incidence of Colorectal Carcinoma in the U.S.: An Update of Trends by Gender, Race, Age, Subsite, and Stage, 1975-1994", *Cancer*, 85(8): 1670-1676, 1999.
- Wingo PA, Ries LAG, Rosenberg HM, Miller DS, Edwards BK: "Cancer Incidence and Mortality, 1973-1995: A Report Card for the U.S.", *Cancer*, 82(6):1197-1207, 1998.
- Wingo PA, Ries LAG, Giovino GA, *et al.*: "Annual Report to the Nation on the Status of Cancer, 1973-1996, With a Special Section on Lung Cancer and Tobacco Smoke", *Journal of the National Cancer Institute*, 91(8):675-690, 1999.
- World Health Organization: *International Classification of Diseases, Ninth Revision, Clinical Modification*, Edwards Bros., Inc., Ann Arbor, MI, 1980.
- World Health Organization (Percy C, VanHolten V and Muir C, eds): *International Classification of Diseases for Oncology, 2nd Ed.*, WHO, Geneva, 1990.